Review of LAs proposed for Hangman Creek and Little Spokane River (SLR) in Spokane River D.O. TMDL (proposed 10/09)

To: David Croxton, Supervisor, OWW-WU

From: David Ragsdale, EPA Region 10, OWW-WU

Per your request I have reviewed the load allocation for the LSR and Hangman Creek in the proposed Spokane River D.O. TMDL. As the EPA lead staff assigned to TMDL development for these Spokane tributaries, I limited my review to evaluating whether these proposed LAs are reasonable/achieveable based on my knowledge of these waters.

The WLAs proposed for the Spokane River dischargers are predicated on achieving LAs for these tributaries AND the large "responsibility" (*load reduction equivalent*) assigned to Avista. For purposes of providing reasonable assurance that the WLAs are appropriate, there must be a defensible rational that load allocations can and will occur within a specified timeframe.

From my review I conclude that the proposed reduction in phosphorus loading from the tributaries is too large and should be reduced to levels which might actually occur as the result of a robust implementation effort. The 2004 and 2007 TMDLs identified greater percent reduction in nutrient loading being needed from the tributaries than the 2009 version, but these TMDLs made no presumption these reductions would actually occur in setting WLAs. Hence, *reasonable assurance* was not a necessary consideration as it is for the 2009 version of the Spokane TMDL. The LAs identified for Hangman and LSR are presented with little explanation other than indicating they represent a 66% reduction from existing critical conditions (2001).

Hangman Creek

A TMDL for fecal coliform, temperature and turbidity (TSS) in Hangman Creek was approved by EPA in September 2009. The approved TMDL was based on extensive analyses by Ecology that included water quality monitoring and modeling of the watershed. The state's analyses revealed that both sediment and nutrients are sequestered in the watershed and significant quantities of these pollutants are only moved into Hangman and downstream into the Spokane River as the result of high runoff/flow events. Springtime rain and/or snow melt are typically responsible for high flows in Hangman. Ambient monitoring data from the mouth of Hangman (see attachments to this message) demonstrates that sediment and phosphorus concentrations (and loading to the Spokane River) increased with flow in Hangman.

Other findings of the Hangman analyses include:

- The Hangman Creek watershed encompasses an area of WA and ID with diverse characteristics (four ecoregions).
- The principle land use activity in the Hangman watershed is dry land farming. Nutrient loading from the very small WWTPs in the watershed are insignificant compared to the loading from nonpoint sources.
- A large percentage of fine sediment and phosphorus transported through the Hangman watershed originate in the upper portion of the watershed. About 60% of the flow in Hangman comes from upstream of the WA/ID border.
- Nutrient loading targets necessary to resolve near-field effects on dissolved oxygen and pH in Hangman may require nutrient loading to be reduced below the levels identified as LAs at the mouth of Hangman (in the proposed 2009 Spokane D.O. TMDL).
- Most of the coarse sediment enters Hangman from erosion of unstable depositional sands in the lower portion of the watershed. These sands are mostly inorganic and are transported as bed load, rather than as TSS.
- Sediment and nutrient loading into and from Hangman Creek (into the Spokane River) vary significantly based on annual precipitation and snow. Loading of both pollutants have declined over the past decade in conjunction with a reduction in high flow events.
- A WARMF model for the Hangman watershed was developed to predict the results of various implementation scenarios on pollutant loading into Hangman Creek. A model scenario based on extensive implementation of best management practices and riparian vegetation restoration throughout the watershed was used for establishing the load allocations for TSS that would provide full protection of sensitive aquatic life. Table 28 below (excerpted from the Hangman TMDL) presents the current and *best potential* reductions of TSS from the various portions of the watershed.

Table 1. Estimated distribution of sources generating suspended sediment. *In sub-watersheds of Hangman Creek under current condition WARMF model scenarios and estimated source reduction expected with implementation of the estimated full protection scenario actions. (Colors correspond to those in Figure 40)*

Sub-Watershed	Current percent of sources	Estimated source reduction	Land Area percent of watershed
Upper Hangman Creek	35%	26%	20%
Little Hangman Creek and Hangman Creek from Tekoa to Bradshaw	26%	16%	19%
Hangman Creek from Bradshaw to Duncan and Rattler Run	1%	15%	8%
Rock Creek	20%	18%	27%
Marshall Creek	2%	8%	11%
Lower Hangman Creek	16%	11%	15%

From Hangman FC bacteria, Temperature and Turbidity TMDL

- The estimated best potential TSS reductions (full protection scenario in TMDL) range from 8 to 26% for the various portions of the Hangman watershed. These reductions were calculated as estimates of the annual average loading but also apply as targets for loading that would occur on a daily- or runoff event-basis.
- The LAs proposed for Hangman in the 2009 Spokane D.O. TMDL represent a percent reduction that exceeds the best potential conditions estimated by Ecology in the approved Hangman TMDL.
- Analytical results for phosphorous in Hangman for the period before 2003 were subsequently determined as having a bias toward a higher concentration. Laboratory analyses reported significantly lower phosphorus concentrations after this bias was corrected in October 2003.
- Water quality modeling for the Spokane River to develop the 2004 and 2007 versions of the TMDL identified that loading during the month of March did not affect Long Lake during the critical period.

Ecology staff working on the Hangman TMDL provided the best estimate of annual phosphorus loading at the mouth of Hangman in the table below.

From Joe Joy, Ecology-EAP (2/17/09)

These are estimated TP loads (lbs/day) based on a multiple regression model of data collected at the mouth of Hangman Creek:

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
1996	811	6546	989	693	183	33	14	7.8	7	14.5	218	1680	933
1997	7084	2867	2634	554	252	79	42	25	21	17.6	30	54	1138
1998	726	483	267	73	164	43	12	4.8	4.2	4.8	12	1006	233
1999	1304	2968	843	138	48	20	11	7.2	5.9	7.0	16	208	465
2000	266	2651	821	376	85	39	12	5.2	5.3	6.0	8	13	357
2001	22	84	260	97	74	8.3	4.2	1.29	0.6	1.5	7	228	66
2002	1056	1127	986	265	42	15	4.2	2.0	2.1	2.6	6	11	293
2003	267	698	600	90	37	7.9	1.6	0.86	1.4	0.78	2	13	143
2004	481	876	199	16.4	184	15	2.7	0.62	0.66	1.4	6	28	151
2005	156	23	134	40	95	8.6	2.0	0.21	0.17	0.67	6	244	59

Phosphorus loading from the above table:

Average of March – May 2001 = 143.7 lbs/day

June 2001 = 8.3 lbs/day

Average of July – October 2001 = 1.65 lb/day

The proposed LAs for total phosphorus at the mouth of Hangman are:

season	flow	Concentration (ug/l)	Loading (lbs/day)	% Reduction
March – May (avg)	229	90	111.8	20
June	31	50	8.4	40
July – October (avg)	9	35	1.7	50

Based on the above information the proposed load allocation for phosphorus during the June – October are higher than the actual loading that occurred during these critical condition months in 2001. The proposed load allocations are supposed to represent a reduction from 2001 conditions.

Even though the TSS LAs in the approved Hangman TMDL are considered potentially achievable, these represent very ambitious pollutant reduction targets. Since TSS and phosphorus loading are closely correlated, the percent reductions estimated for TSS with total implementation (best potential conditions presented in Table 28 above) are also representative of the best potential phosphorus reductions. The TSS LAs do not include any margin of safety to account for any portion of the watershed where full implementation will not occur. There is also a presumption in the approved Hangman TMDL that a significant reduction of nutrient loading into Hangman from the Idaho portion of the watershed will occur. Much of this portion of the Hangman watershed lies within the reservation boundaries of the Coeur d'Alene Tribe. Although the Tribe is very interested in improving conditions of Hangman, there is no TMDL, no jurisdictional authority to insure implementation of a water quality improvement plan, nor any funding mechanism identified to justify presumptions that significant reduction of nutrient loading above the WA border will actually occur.

Finally, there are no local or national examples where TSS or nutrient loading from nonpoint sources has been successfully reduced by a significant fraction of the amount called for in the Hangman TMDL. This poor experience was recently highlighted by a report from the National Nutrient Workgroup (A Call to Action). The above information calls into question whether the TSS loading targets identified in the Hangman TMDL might be achieved. Given the relationship between TSS and phosphorus loading, there is certainly no basis to presume that an even greater reduction in phosphorus loading (as called for in the proposed Spokane D.O. TMDL) can possibly be achieved.

Little Spokane River (LSR)

There is significant year-round inflow of groundwater (from the Prairie Rathdrum aquifer) into LSR which produces a critical season base flow of approximately 360 to 380 cfs. Monitoring by Ecology of the groundwater springs at the state fish hatchery documented that the phosphorus concentration is approximately 8.0 ug/l. This concentration is representative of the estimated natural phosphorus level found in the lower portion of the Rathdrum Prairie aquifer. Ambient monitoring documented phosphorus concentrations in LSR range between 8.5 to 12 ug/l when surface water approaches base flow conditions. This concentration range is representative of monitoring results after the analytical bias for phosphorus was resolved by Ecology in 2004. Phosphorus concentrations in LSR increase during periods of high flow, indicating that surface runoff is contributing additional phosphorus. How much of the increased loading observed during elevated flow conditions is attributable to human activities in the LSR watershed will be determined in the TMDL currently being developed by Ecology.

The phosphorus concentrations in LSR during low flow conditions are very similar to the natural groundwater condition. The TMDL proposes LAs representing a 36% reduction from the low

flow conditions in 2001. There are no activities, BMPs or treatments that can be applied to this large volume of groundwater to reduce phosphorus concentrations by even a modest amount, much less achieve this enormous pollutant reduction target.

* Link to Ecology ambient monitoring data website:

http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?theyear=2004&tab=final_data&scrolly=384&wria=55&sta=55B070&docextension=.xls&docextension=.xls